

CHAPTER 4N. IN-ROADWAY LIGHTS

Section 4N.01 Application of In-Roadway Lights

Support:

01 In-Roadway Lights are special types of highway traffic signals installed in the roadway surface to warn road users that they are approaching a condition on or adjacent to the roadway that might not be readily apparent and might require the road users to slow down and/or come to a stop. This includes situations warning of marked school crosswalks, marked midblock crosswalks, marked crosswalks on uncontrolled approaches, marked crosswalks in advance of roundabouts as described in Chapter 3C, and other roadway situations involving pedestrian crossings.

Standard:

02 **In-Roadway Lights shall not be used for any application that is not described in this Chapter.**

03 **If used, In-Roadway Lights shall not exceed a height of 3/4 inch above the roadway surface.**

04 **When used, In-Roadway Lights shall be flashed and shall not be steadily illuminated.**

Support:

05 Steadily illuminated lights installed in the roadway surface are considered to be internally illuminated raised pavement markers (see Section 3B.11).

Option:

06 In-Roadway Lights may be flashed in a manner that includes a continuous flash of varying intensity and time duration that is repeated to provide a flickering effect (see Section 4N.02).

Section 4N.02 In-Roadway Warning Lights at Crosswalks

Option:

01 In-roadway lights may be installed at certain marked crosswalks, based on an engineering study or engineering judgment, to provide additional warning to road users.

Standard:

02 **If used, In-Roadway Warning Lights at crosswalks shall be installed only at marked crosswalks with applicable warning signs. They shall not be used at crosswalks controlled by YIELD signs, STOP signs, or traffic control signals.**

03 **If In-Roadway Warning Lights are used at a crosswalk, the following requirements shall apply:**

A. Except as provided in Paragraphs 7 and 8, they shall be installed along both sides of the crosswalk and shall span its entire length.

B. They shall initiate operation based on pedestrian actuation and shall cease operation at a predetermined time after the pedestrian actuation or, with passive detection, after the pedestrian clears the crosswalk.

C. They shall display a flashing yellow light when actuated. The flash rate shall be at least 50, but no more than 60, flash periods per minute. If they are flashed in a manner that includes a continuous flash of varying intensity and time duration that is repeated to provide a flickering effect, the flickers or pulses shall not repeat at a rate that is between 5 and 30 per second to avoid frequencies that might cause seizures.

D. They shall be installed in the area between the outside edge of the crosswalk line and 10 feet from the outside edge of the crosswalk.

E. They shall face away from the crosswalk if unidirectional, or shall face away from and across the crosswalk if bidirectional.

04 **If used on one-lane, one-way roadways, a minimum of two In-Roadway Warning Lights shall be installed on the approach side of the crosswalk. If used on two-lane roadways, a minimum of three In-Roadway Warning Lights shall be installed along both sides of the crosswalk. If used on roadways with more than two lanes, a minimum of one In-Roadway Warning Light per lane shall be installed along both sides of the crosswalk.**

Guidance:

05 *If used, In-Roadway Warning Lights should be installed in the center of each travel lane, at the center line of the roadway, at each edge of the roadway or parking lanes, or at other suitable locations away from the normal tire track paths.*

06 *The location of the In-Roadway Warning Lights within the lanes should be based on engineering judgment.*

Option:

07 On one-way streets, In-Roadway Warning Lights may be omitted on the departure side of the crosswalk.

08 Based on engineering judgment, the In-Roadway Warning Lights on the departure side of the crosswalk on the left side of a median may be omitted.

09 Unidirectional In-Roadway Warning Lights installed at crosswalk locations may have an optional, additional yellow light indication in each unit that is visible to pedestrians in the crosswalk to indicate to pedestrians in the crosswalk that the In-Roadway Warning Lights are in fact flashing as they cross the street. These yellow lights may flash with and at the same flash rate as the light module in which each is installed.

Guidance:

10 *If used, the period of operation of the In-Roadway Warning Lights following each actuation should be sufficient to allow a pedestrian crossing in the crosswalk to leave the curb or shoulder and travel at a walking speed of 3.5 feet per second to at least the far side of the traveled way or to a median of sufficient width for pedestrians to wait. Where pedestrians who walk slower than 3.5 feet per second, or pedestrians who use wheelchairs, routinely use the crosswalk, a walking speed of less than 3.5 feet per second should be considered in determining the period of operation.*

Standard:

11 **If pedestrian pushbuttons are used to actuate the in-roadway lights, a Push Button To Turn On Warning Lights (with pushbutton symbol) (R10-25) sign (see Figure 2B-26) shall be mounted adjacent to or integral with each pedestrian pushbutton.**

12 **Where the period of operation is sufficient only for crossing from a curb or shoulder to a median of sufficient width for pedestrians to wait, median-mounted pedestrian actuators shall be provided.**

Standard:

In-Roadway Warning Lights (IRWLs) shall not be placed on or within the crosswalk markings. If the In-Roadway Warning Lights are activated by a push button, the PUSH BUTTON FOR PEDESTRIAN WARNING LIGHTS, CROSS WITH CAUTION (R62E(CA)) sign shall be used.

The following shall be considered when evaluating the need for In-Roadway Warning Lights:

- a. Whether the crossing is controlled or uncontrolled.
- b. An engineering traffic study to determine if In-Roadway Warning Lights are compatible with the safety and operation of nearby intersections, which may or may not be, controlled by traffic signals or STOP/YIELD signs.
- c. Standard traffic signs for crossings and crosswalk pavement markings are provided.
- d. At least 40 pedestrians regularly use the crossing during each of any two hours (not necessarily consecutive) during a 24-hour period.
- e. The vehicular volume through the crossing exceeds 200 vehicles per hour in urban areas or 140 vehicles per hour in rural areas during peak-hour pedestrian usage.
- f. The critical approach speed (85th percentile) is 45 mph or less.
- g. In-Roadway Warning Lights are visible to drivers at the minimum stopping sight distance for the posted speed limit.
- h. Public education on In-Roadway Warning Lights is conducted for new installations.

Option:

Overhead or roadside Flashing Yellow Beacons may be installed in conjunction with In-Roadway Warning Lights. In-Roadway Warning Lights may be installed independently, but are not necessarily intended to be a substitute for standard flashing beacons. Engineering judgment should be exercised.

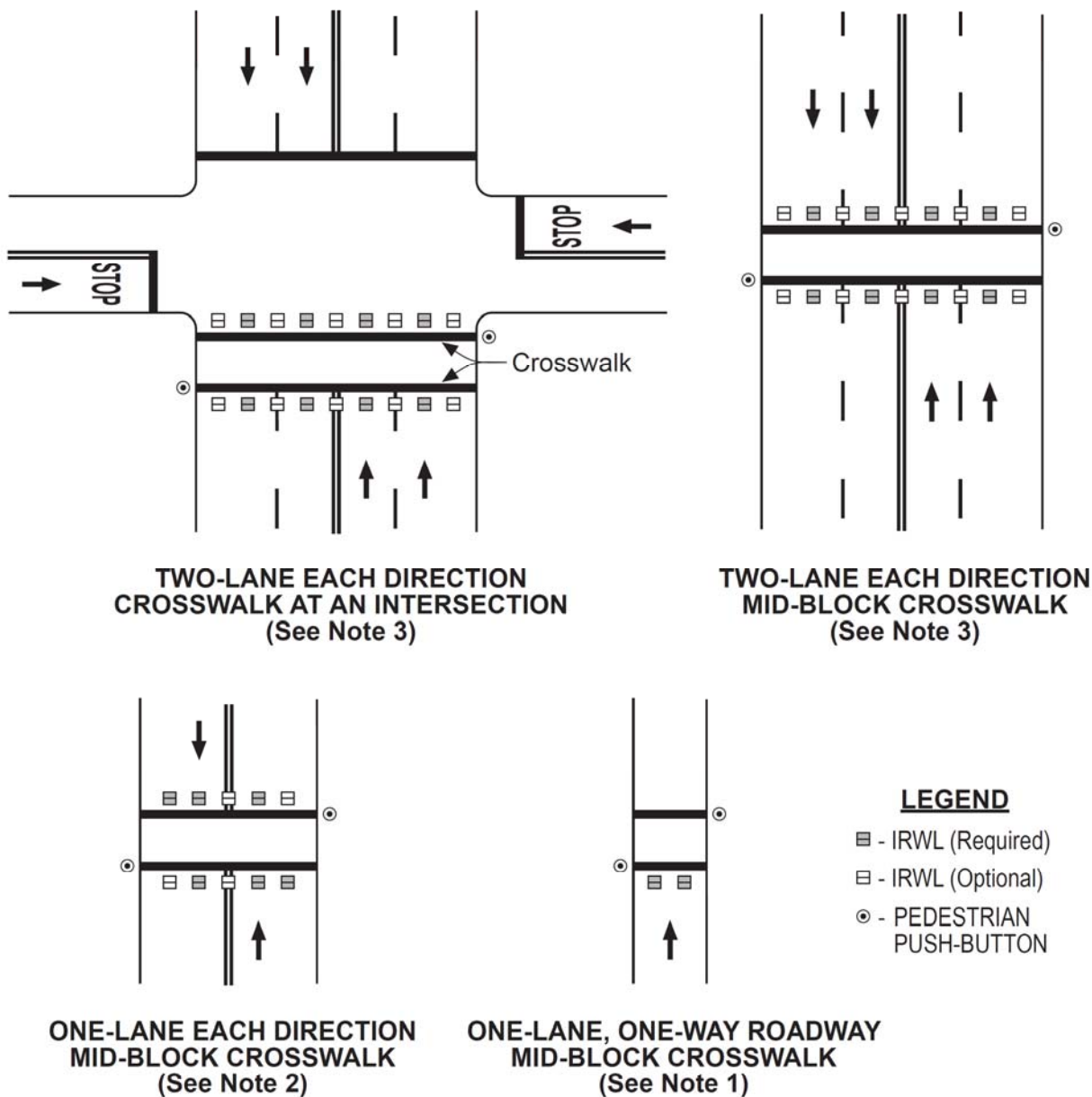
Guidance:

Typical applications of In-Roadway Warning Lights are shown in Figure 4N-101(CA).

Section 4N.101(CA) In-Roadway Warning Lights at Crosswalks Financing and Maintenance-State Highways
Standard:

When In-Roadway Warning Lights are proposed by Department of Transportation on State highways, the Department of Transportation shall pay the costs of installation and maintenance. When In-Roadway Warning Lights are proposed and installed by a local agency on State highways, the installation of In-Roadway Warning Lights shall be covered by an Encroachment Permit issued by the local District Director of Department of Transportation. The local agency shall be responsible for installation and maintenance of the In-Roadway Warning Lights.

Figure 4N-101 (CA). Typical Layout for In-Roadway Warning Lights (IRWLs)



NOTES:

1. One-Lane, One-Way Roadways, a minimum of two IRWLs shall be installed on the approach side of the crosswalk.
2. One-Lane each direction, a minimum of three IRWLs shall be installed along both sides of the crosswalk.
3. Two-Lanes each direction, a minimum of one IRWLs per lane, shall be installed along both sides of the crosswalk.
4. IRWLs should be located off the tire tracks.